

(12) UK Patent Application (19) GB (11) 2 283 451 (13) A

(43) Date of A Publication 10.05.1995

(21) Application No 9421979.7

(22) Date of Filing 31.10.1994

(30) Priority Data

(31) 08144475 (32) 02.11.1993 (33) US

(71) Applicant(s)

FMC Corporation

(Incorporated in USA - Delaware)

200 East Randolph Drive, Chicago, Illinois 60601,
United States of America

(72) Inventor(s)

Emiel Y Lambrecht

(74) Agent and/or Address for Service

Phillips & Leigh

7 Staple Inn, Holborn, LONDON, WC1V 7QF,
United Kingdom

(51) INT CL⁵

B26D 1/26, B26F 1/38

(52) UK CL (Edition N)

B4B B29A

(56) Documents Cited

GB 1479645 A GB 0583224 A

(58) Field of Search

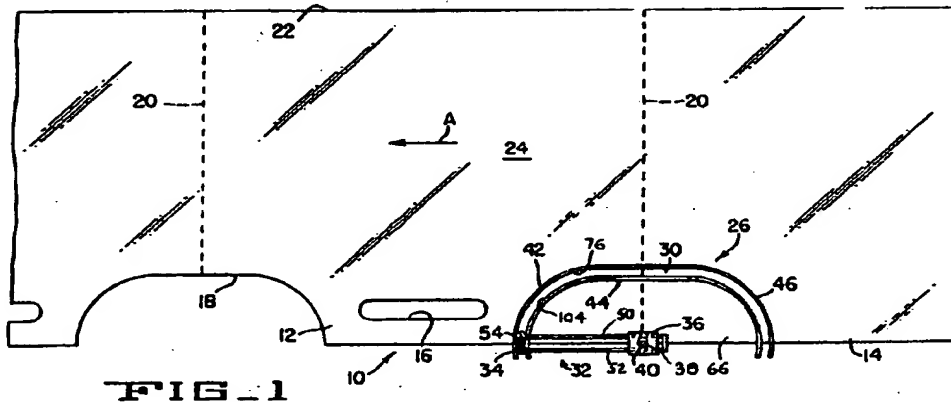
UK CL (Edition M) B4B B29A B29B

INT CL⁵ B26D 1/00 1/01 1/12 1/25 1/26, B26F 1/38

ONLINE DATABASES : WPI

(54) Tracked knife accessory

(57) A cutter assembly 26 comprises a cutter movable along a guide track 30 to form a cut-out 18 in a sheet of material 12, 14. The cutter has a blade (64 fig 4) carried by a trolley 34 having followers (56, 58 fig 4) which are guided in the guide track. The trolley is pivotally attached 54 to a cutter arm 32 which is arcuately driven about an axis 40. The cutter arm is slidable either over the axis 40 or over the pivotal connection to the trolley (figs 7, 8). Arcuate movement of the cutter arm causes the trolley to follow the guide track and thus cause the blade to cut along a prescribed path designated by the guide track.



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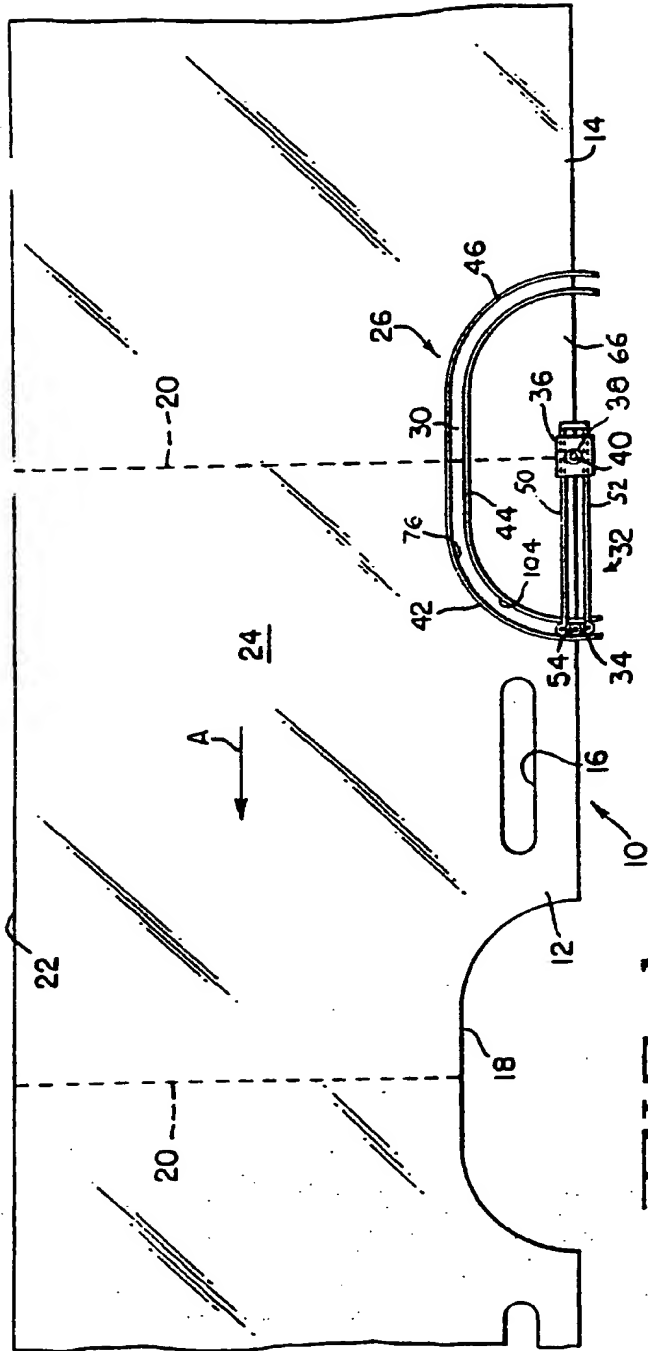


FIG-1

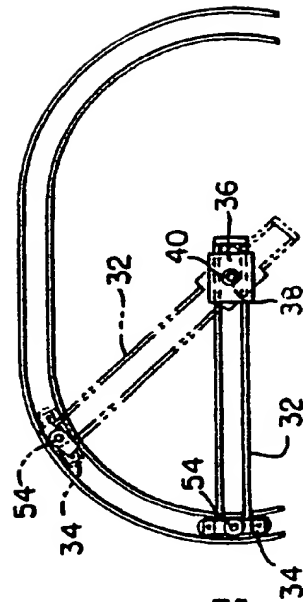


FIG-2

FIG. 3

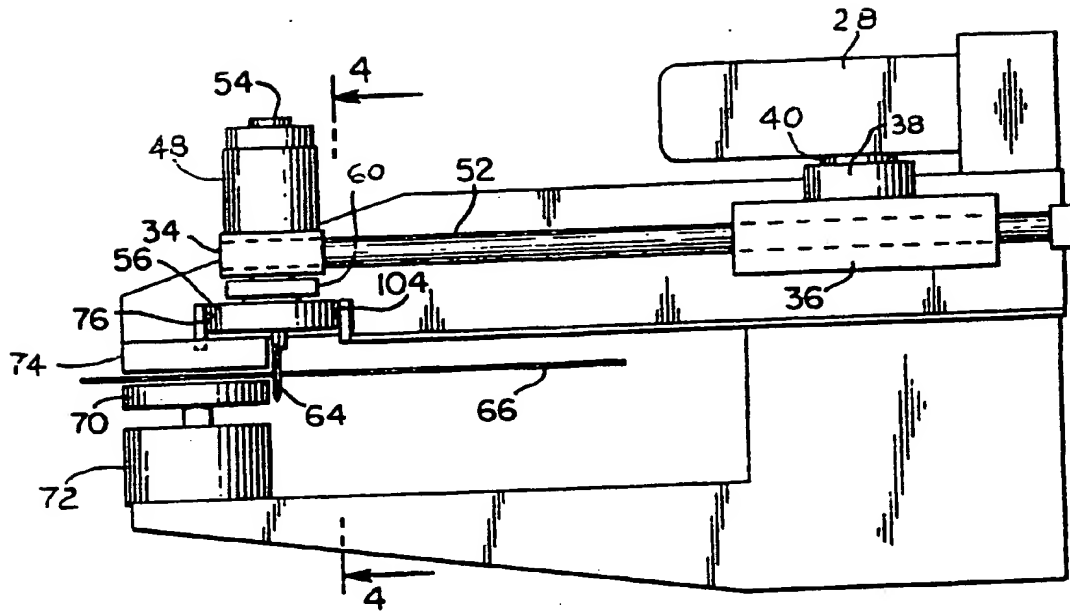
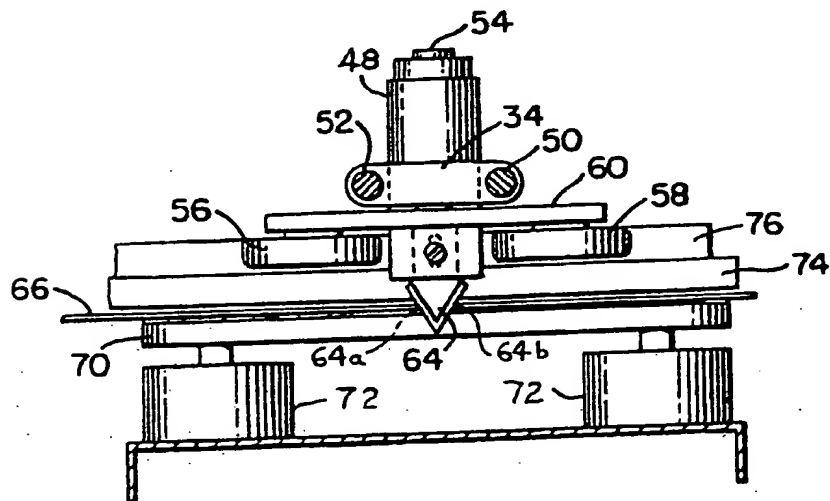
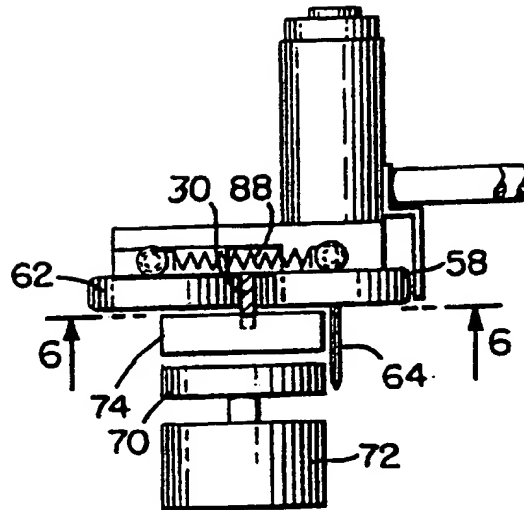


FIG. 4



3 / 4

FIG_5



FIG_6

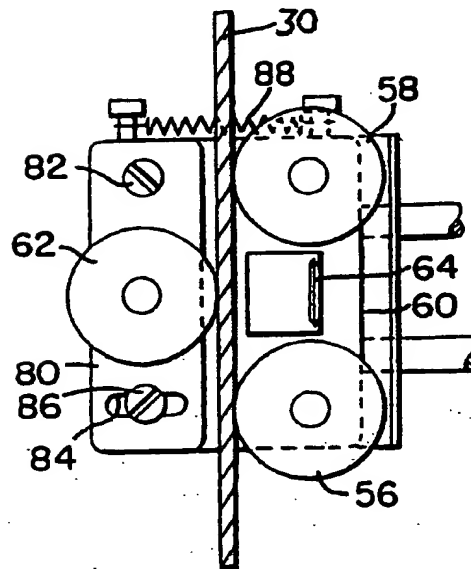


FIG-7

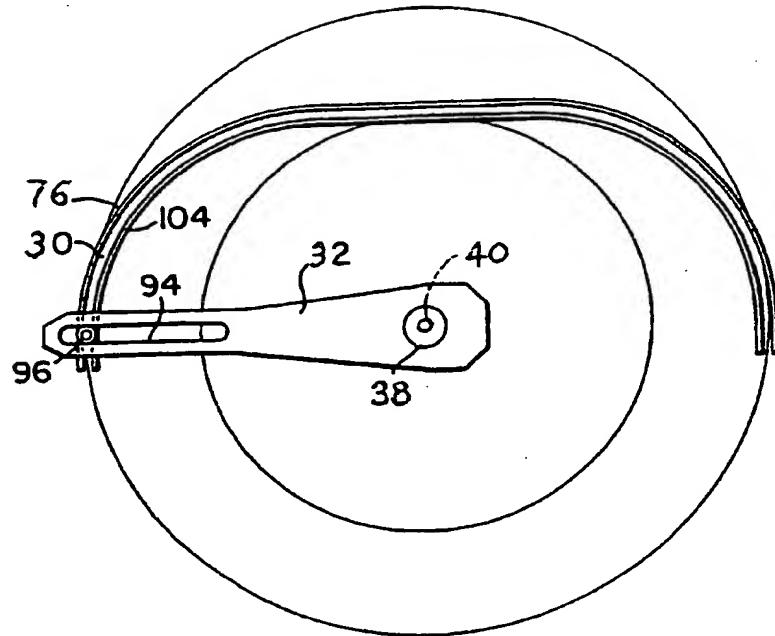
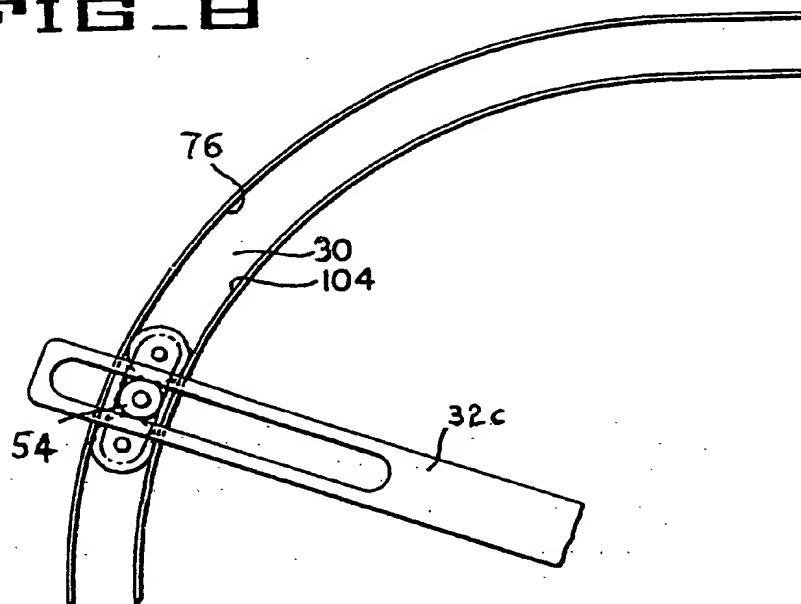


FIG-8



TRACKED KNIFE ACCESSORY

This invention has to do with cutter assemblies or accessories that are used to cut a film or sheet material along a prescribed path. Such cutter assemblies may be used for example in bag machines of the type that produce plastic bags from plastic film at high rates of production. More particularly the invention presented herein concerns a track guided knife that may advantageously be used to cut segments out of a stream of bags during the continuous bag production process. The knife cuts two adjacent bags in a single pass.

Broadly, the present invention provides a cutter assembly for use in cutting a film or sheet material along a prescribed path, comprising:-

- a trolley carrying a knife blade;
- track followers carried on the trolley; and
- a guide track contacting the track followers to guide the trolley along the prescribed path.

More specifically the present invention provides a cutter assembly for use in cutting selvage from a plastic film in the production of plastic bags, comprising:

- clamp means to restrain the film during a cutting operation;

- a rotary actuator;

- a cutter arm movable through an arc by the rotary actuator;

- a trolley pivotally attached at an outboard end of the cutter arm;

- a knife blade carried on the trolley, having a cutting portion on two sides thereof allowing the knife to cut the film when the knife is moving in a first or in a second direction;

track followers carried on the trolley; and
a guide track for contacting the track followers and
guiding the trolley along a prescribed path when the cutter
arm is moved by the rotary actuator through said arc.

The present invention also provides a method of cutting
a film or sheet material along a prescribed path, using the
cutter assembly broadly defined above, comprising the steps
of:

positioning the film or sheet material at a location
where it can be cut by the knife blade, and

moving the trolley along the guide track whereby the
knife blade is guided to cut the film or sheet material along
the prescribed path.

Where the blade can cut in either of two directions, the
method may advantageously comprise the steps of:

positioning a first portion of the film or sheet
material at a location where it can be cut by the knife
blade;

moving the trolley along the guide track to move the
knife in the first direction, whereby the knife blade is
guided to cut the film or sheet material along a first part
of the prescribed path;

indexing a second part of the film or sheet material
into a location where it can be cut by the knife blade; and

moving the trolley along the guide track to move the
knife in the second direction, whereby the knife blade is
guided to cut the film or sheet material along a second part
of the prescribed path.

The invention further comprises a method of cutting
selvage from a plastic film during the production of plastic
bags by means of a knife carried on a supporting trolley, the
trolley being carried at the outboard end of a cutting arm,
comprising the steps of:-

positioning a first portion of the film at a location for cutting by the knife;

actuating the cutting arm to swing through an arc while the knife contacts the film to thereby cut selvage from it; and

parking the cutting arm at the end of the arc.

Further preferred features of the invention are in the dependent claims.

The bag product that is made using preferred embodiments of the novel cutter assembly is a "handle bag" and more specifically a handle part of a diaper bag. Plastic diaper bags are in widespread use for packaging consumer quantity packages of prefolded diapers often made of paper products. The prefolded diapers are compressed into generally rectangular bundles which could be difficult for a consumer to carry without the handle that is often formed integral with the diaper bag.

Such bags are produced on continuously run bag machines from film let off from a stand containing a roll of film. The film may be folded, gusseted, perforated, punched and welded at various stations of the bag machines as is well known. One station could be used to cut out the selvage adjacent the handle part of the bag. In the known devices this cut-out could be cut by several methods such as with a serrated knife, with a flying knife on a belt or with a heated knife.

The serrated blade knife, which was usually a punching operation, did not give a nice clean cut but left a rather jagged edge which is aesthetically undesirable.

Flying knife cutters are complex and to cut a shape different from the designed in shape the entire flying knife unit has to be replaced.

The system presented herein, which in preferred embodiments will cut portions of two adjacent bags at once, includes a knife mounted to a trolley. The trolley may follow a track which follows the path which determines the shape to be cut. The trolley is preferably driven by a swing arm that is driven by a rotary actuator as will be explained further on.

One advantage of these preferred embodiments is that the knife can cut in both a first and a second direction allowing it to make a single stroke per machine cycle without needing a non-cutting return stroke.

These and other advantages of the invention will be apparent from reading the following description of illustrative embodiments made with reference to the drawing figures of which like reference numerals identify like elements and in which:-

Fig. 1 is a plan view of a first embodiment of the invention shown in a simplified presentation;

Fig. 2 is a plan view showing more detail of the embodiment of Fig. 1;

Fig. 3 is a side elevation view of the cutter assembly of Figs. 1 and 2 mounted for production;

Fig. 4 is a partially cross sectioned portion of the knife holder and trolley taken through plane 4-4 of Fig. 3;

Fig. 5 is a partially cross sectioned portion of the knife holder and trolley of an alternative embodiment;

Fig. 6 is a view taken through plane 6-6 of Fig. 5;

Fig. 7 shows another embodiment of the invention; and

Fig. 8 shows yet another embodiment of the invention.

Referring now to the drawing figures, one of the embodiments of the invention is shown in Fig. 1. This figure also presents the general environment 10 of the invention which will be fully understood by persons familiar with the construction of plastic bags on high speed continuous development bag machines.

In this figure several portions of bags are shown. For instance a leading bag, which is attached at a perforation to an even earlier leading bag, is attached at a perforation or seam 20 to a trailing bag 14. For purposes of this disclosure it is convenient to treat these bags as completed bags except for completion of separation of the bags from each other and cutting the selvage out between the handle 16 portion of the bags. The bags will include a body portion 24 and a bottom edge 22. The bags will move through the process travelling from right to left, in this embodiment, as shown by the arrow A.

Item 26 is the cutter assembly including its guide system. Visible in Fig. 1 is an arm 32 of the cutter, a knife supporting trolley 34, a guide or cam track or rail guidance system 30 having guide surfaces 76 and 104 comprising a straight portion 44 between a first curved portion 42 and a second curved portion 46. Although the details of the structure will be set forth below, the cut-out 18 is formed when the arm 32, pivoted on pivot point 40 is swung through the arc defined by the track 30. The film will be held firmly by a clamp system to assist in a clean cut. The arm will cut in both directions making one cut a first direction and then after the bag stream is indexed to the next space between handles the knife will be cycled back in the other direction cutting as it goes to the rest point

shown in Fig. 1.

In Figs. 1 and 2 the knife holder and guide trolley 34 is fixed to the end of the arm 32, which in this embodiment is a pair of rods that are carried in a rotatable block 36 in a slidable manner, and the inboard ends of the arms are axially slidable in the block 36 so that the radius between the pivot point 40 of the arm and block and the guide trolley location 34 is adjustable as the trolley follows the cam track 30.

In Figs. 7 and 8 alternative embodiments are presented. They are similar to the apparatus shown in Fig. 1 with the difference being that the knife holder and guide trolley are not fixed to the end of the arm but are variable inboard and outboard on the arm while the inboard end of the arm is directly fixed to a rotatable shaft.

Figs. 3 and 4 set forth the details of the operative assembly set forth generally in Figs. 1 and 2. The film 66 in these views is shown between a lower clamping plate 70 and an upper guide support 74. The lower clamping plate 70, by means of clamping cylinders such as 72, will clamp the film 66 between the upper guide support 74 and itself. This will hold the film stationary so that knife 64 can cleanly cut the film 66 to remove the selvage or cutout 18.

The knife 64 is provided with cutting edges 64a and 64b to enable it to cut the film in either a first or second direction as explained above. The knife 64 is held in the knife holder and guide trolley 34, which also includes attachment points for the first tubular or rod-like arm 50 and the second tubular or rod-like arm 52. A trolley base 60 is integral with the knife holder and guide trolley 34 and provides a mounting base for the pair of track or cam followers 56 and 58 which are mounted for rotary movement on axles carried by the trolley base 60. The trolley base 60

is also the direct attachment point for the knife holder. The trolley base 60 is pivotally mounted through pivot point 54 to a main body 48 such that the trolley base 60 can swivel independently of piece 34 which is integral with the main body 48 and held in a fixed position through its fixed attachment, in the embodiment shown in Fig. 3, to the arm 32 (comprised of the rods 52 and 50 - Fig. 4).

The arm 32 is mounted through the block or central housing 36 in a way that allows the arm to change its effective radius by means of the rods 50 and 52 sliding through apertures, actually long bores in the central housing. The central housing 36 is axially mounted by means of a central axle housing 38 pivoting on a pivot point such as 40 which acts as the axle. Looking at Fig. 1 and Fig. 3 it can be seen that the arm 32 can be urged transversely through the central housing 36 responsive to the cam followers 56 and 58 following the cam track 30. As the track goes from a curved portion 42 through the straight portion 44 and into the curved portion 46 the effective radius from the knife 64 to the axle pivot point 38 will change. The arm 32 or rods 52 and 50 moving through the central housing 36 will accommodate the radius change and let the knife follow the path dictated by the cam track 30.

The knife will make a first swing being driven by a rotary actuator 28 which can be an electric, air or hydraulic motor means as appropriate to swing the arm through an arc of approximately, and slightly more than, one hundred and eighty degrees, looking at Fig. 1 in a clockwise direction and cut the cut-out such as 18 from the leading bag 12 (making a trailing cutout) and from the trailing bag 14 (making the leading cutout). The knife and arm will then park at a location one hundred and eighty degrees from its starting point until the next set of connected uncut bags is indexed to the zone where the selvage cutout is formed. When the next set of bags is indexed the knife will make a second

swing, this time in a counter clockwise direction and cut the cutout such as 18 from the trailing bag (making the leading cutout) and from the leading bag (making the trailing cutout). The knife and arm will then park as in Fig. 1 and await for the bags to be indexed to the next perforation where the cycle will be repeated.

Figs. 5 and 6 show an alternative embodiment of the invention. In this embodiment only a single rail or single upstanding wall forms a cam track 30 having two sides thereto which is used to guide the knife 64. The cam track 30 has two cam followers 56 and 58 on one side of the cam track 30. The cam followers 56 and 58 are attached to the trolley base 60 in a rotatable manner similar to the cam followers 56 and 58 of Fig. 1. However, a third cam follower 62 is provided on a spring loaded support 80 which pivots about pivot point (screw) 82 and is urged into engagement with the cam track 30 by means of spring 88. Guide slot 84 and guide 86 contain the cam follower support 80.

The apparatus of the knife 64 shown in Figs. 5 and 6 is similar to that shown in Fig. 1 and the operation cycle is as disclosed above. The only difference is the use of three cam followers operating on and guided by a single wall-like cam track versus two cam followers operating between two opposed cam track guides as shown in Fig. 1.

Fig. 7 shows another embodiment of the invention. In this embodiment an arm 32b is provided with an elongated aperture that allows a slot follower 96 to move inwardly and outwardly on the arm as the arm swings along the cam track 30. The slot follower 96 would project upward from the trolley base which includes the pair of cam followers 56 and 58 and the knife 64 as shown in Fig. 1. The difference here is that the trolley is not fixed to the outboard end of the arm but is free to move. The inboard end of the arm is fixed so all radius changes are accomplished by the trolley

moving on the arm.

Fig. 8 shows an up close version of the device shown in Fig. 7 with a slight difference in the shape of the arm 32c as compared to the arm 32b. Functionally there is no difference between the Fig. 7 and Fig. 8 apparatus.

The above disclosure attempts to set forth several embodiments of the invention with the preferred embodiment being the Fig. 1 embodiment. It will be apparent to one of skill in the bag machinery art that nuances of design and combinations of the embodiments set forth herein are possible within the scope of the invention as defined in the claims.

CLAIMS

1. A cutter assembly for use in cutting a film or sheet material along a prescribed path, comprising:-

a trolley carrying a knife blade;
track followers carried on the trolley; and
a guide track contacting the track followers to guide the trolley along the prescribed path.

2. A cutter assembly as claimed in claim 1 comprising a cutter arm arcuately movable by a rotary actuator, the trolley being pivotally mounted to an outboard end of the arm.

3. A cutter assembly as claimed in claim 2 wherein the arm is arcuately reciprocable by the actuator.

4. A cutter assembly as claimed in claim 2 wherein the arm is arcuately reciprocable by the actuator through more than 180 degrees.

5. A cutter assembly as claimed in any of claims 2-4 wherein the cutter arm is supported on a central housing.

6. A cutter assembly as claimed in claim 5 wherein the cutter arm is longitudinally movable through the central housing.

7. A cutter assembly as claimed in claim 5 wherein the cutter arm is fixed to the central housing and the trolley is movable longitudinally of the cutter arm.

8. A cutter assembly as claimed in claim 7 wherein the cutter arm is provided with an aperture that may receive a guide projection provided on the trolley.

9. A cutter assembly as claimed in any of claims 5-8 wherein the cutter arm comprises two rods extending from the central housing to the trolley.

10. A cutter assembly as claimed in any preceding claim comprising clamp means to restrain the film or sheet during a cutting operation.

11. A cutter assembly as claimed in any preceding claim, wherein the guide track includes two side walls each disposed on a separate track part and the track followers reside between the side walls of the guide track.

12. A cutter assembly as claimed in any preceding claim wherein the track followers include a first and second track follower.

13. A cutter assembly as claimed in claim 12 wherein the guide track includes a wall having opposed sides and at least one of the track followers contacts one of each of the sides of the wall.

14. A cutter assembly as claimed in any preceding claim, wherein the knife blade has a cutting portion on two sides thereof, allowing the blade to cut the film or sheet when the knife is moving in a first or a second direction.

15. A method of cutting a film or sheet material along a prescribed path using a cutter assembly as claimed in any of claims 1-13 comprising the steps of positioning the film or sheet material at a location where it can be cut by the knife blade, and moving the trolley along the guide track whereby the knife blade is guided to cut the film or sheet material along the prescribed path.

16. A method of cutting a film or sheet material along a prescribed path using a cutter assembly as claimed in claim 14, comprising the steps of:

positioning a first portion of the film or sheet material at a location where it can be cut by the knife blade;

moving the trolley along the guide track to move the knife in the first direction, whereby the knife blade is guided to cut the film or sheet material along a first part of the prescribed path;

indexing a second part of the film or sheet material into a location where it can be cut by the knife blade; and

moving the trolley along the guide track to move the knife in the second direction, whereby the knife blade is guided to cut the film or sheet material along a second part of the prescribed path.

17. A cutter assembly for use in cutting selvage from a plastic film in the production of plastic bags, comprising:

clamp means to restrain the film during a cutting operation;

a rotary actuator;

a cutter arm movable through an arc by the rotary actuator;

a trolley pivotally attached at an outboard end of the cutter arm;

a knife blade carried on the trolley, having a cutting portion on two sides thereof allowing the knife to cut the film when the knife is moving in a first or in a second direction;

track followers carried on the trolley; and

a guide track for contacting the track followers and guiding the trolley along a prescribed path when the cutter arm is moved by the rotary actuator through said arc.

18. A method of cutting selvage from a plastic film during the production of plastic bags, by means of a knife carried on a supporting trolley, the trolley being carried at the outboard end of a cutting arm, comprising the steps of:-

positioning a first portion of the film at a location for cutting by the knife;

actuating the cutting arm to swing through an arc while the knife contacts the film to thereby cut selvage from it; and

parking the cutting arm at the end of the arc.

19. A cutter assembly substantially as described with reference to or as shown in Figs. 1 to 4 or Figs. 5 and 6 or Fig. 7 or Fig. 8 of the drawings.

20. A method of cutting selvage from a plastic film during the production of plastic bags, substantially as described with reference to the drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
 GB 9421979.7

Relevant Technical Fields

- (i) UK Cl (Ed.M) B4B (B29A, B29B)
 (ii) Int Cl (Ed.5) B26D (1/00, 01, 12, 25, 26); B26F (1/38)

Search Examiner
 H F YOUNG

Date of completion of Search
 9 DECEMBER 1994

Databases (see below)

- (i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
 1-17, 19

(ii) ONLINE DATABASES: WPI

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
 Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
 A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

| Category | Identity of document and relevant passages | Relevant to claim(s) |
|----------|--|----------------------|
| X | GB 1479645 (PATERSON) see Figures 1 and 2 | 1,10-15 |
| X | GB 583224 (DUNLOP) see Figure 1 | 1,10-15 |

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